

## **REMARKS**

Claims 1-3, 6-14 and 16-21 are all the claims pending in the application.

### **I. Claim Rejections under 35 U.S.C. 112, second paragraph**

Claims 1-3, 6-14 and 16-21 have been rejected under 35 U.S.C. 112, second paragraph as being indefinite. In particular, the Examiner has indicated that it is not clear what is meant by “sharply falls vertically”.

In view of the Examiner’s comments, Applicants note that the claims have been amended so as to remove each instance of the phrase “sharply falls vertically”. Further, Applicants note that claims 9, 17 and 21 have been amended so as to remove the term “sharply” therefrom.

In view of the foregoing, Applicants kindly request that the above-noted rejection be reconsidered and withdrawn.

### **II. Claim Rejections under 35 U.S.C. 103(a)**

A. Claims 1-3, 6, 14 and 16 have been rejected under 35 U.S.C. § 103(a) as being unpatentable over Stava (US 6,501,049) in view of Oku (US 3,376,473) and Shintani et al. (US 6,255,618).

Claim 1, as amended, recites the feature of decreasing the welding current so as to fall vertically to a first current not smaller than a first predetermined lower limit, the first predetermined lower limit having a current value greater than that of the base current, on detecting a neck that appears just before recovery from the short circuit.

Applicants respectfully submit that the cited prior art references do not teach or suggest at least the above-noted feature recited in amended claim 1.

Regarding Stava, Applicants note that this reference discloses an arc welding process in Fig. 3 in which current decreases at 110c to a low current 106 (see col. 5, lines 37-40). Further, in the Office Action, the Examiner has indicated that Stava discloses a current peak shown at 124 and a base current before time 102 (see Office Action at page 2).

Based on the foregoing, Applicants note that while Stava discloses a base current before time 102 and a low current at 106, that Stava does not disclose or suggest the above-noted feature recited in amended claim 1 of decreasing the welding current so as to fall vertically to a first current not smaller than a first predetermined lower limit, the first predetermined lower limit having a current value greater than that of the base current, on detecting a neck that appears just before recovery from the short circuit.

Regarding Oku, Applicants note that while Oku teaches that the voltage-current gradient of the output characteristic is varied (see col. 4, lines 1-2), that Oku does not disclose, suggest or otherwise render obvious the above-noted feature recited in amended claim 1 of decreasing the welding current so as to fall vertically to a first current not smaller than a first predetermined lower limit, the first predetermined lower limit having a current value greater than that of the base current, on detecting a neck that appears just before recovery from the short circuit.

Regarding Shintani, Applicants note that while this reference discloses the use of a reference value storage portion, that Shintani does not disclose, suggest or otherwise render obvious the above-noted feature recited in amended claim 1 of decreasing the welding current so as to fall vertically to a first current not smaller than a first predetermined lower limit, the first predetermined lower limit having a current value greater than that of the base current, on detecting a neck that appears just before recovery from the short circuit.

In view of the foregoing, Applicants respectfully submit that the cited prior art references, either alone or in combination, do not teach, suggest or otherwise render obvious the above-noted feature recited in amended claim 1. Accordingly, Applicants submit that amended claim 1 is patentable over the cited prior art, an indication of which is kindly requested.

It is noted that by providing the above-noted feature recited in amended claim 1, an advantageous effect is produced because it is possible to prevent excessive low current causing a lack of arc when decreasing the current (e.g., see the specification at page 11, line 27 through page 12, line 18).

Regarding claims 2, 3, 6, 14 and 16, Applicants note that these claims depend from claim 1 and are therefore considered patentable at least by virtue of their dependency.

In addition, regarding claim 3, Applicants note that this claim has been amended to recite that welding current is decreased to a second current not smaller than a second predetermined lower limit on detection of the short circuit between the welding wire and the welding base material, the welding current is maintained at the second current for a predetermined period by carrying out constant current control, and then the current having the gradient smaller than the gradient at the pulse rise of the current waveform of the pulse is applied.

With respect to the above-noted feature recited in amended claim 3, Applicants note that while Stava discloses a low current at 106, that Stava does not disclose or suggest the above-noted feature recited in amended claim 3 which indicates that welding current is decreased to a second current not smaller than a second predetermined lower limit on detection of the short circuit between the welding wire and the welding base material, the welding current is maintained at the second current for a predetermined period by carrying out constant current

control, and then the current having the gradient smaller than the gradient at the pulse rise of the current waveform of the pulse is applied.

Further, Applicants submit that Shintani does not cure the above-noted deficiency of Stava. Accordingly, Applicants submit that claim 3 is patentable over the cited prior art, an indication of which is kindly requested.

It is noted that by providing the above-noted feature recited in claim 3, that an advantageous effect is provided, that is, reducing the amount of spatters caused upon the occurrence of a short circuit in the pulse welding (e.g., see the specification at page 13, lines 13-27).

B. Claims 7-10, 12 and 13 have been rejected under 35 U.S.C. 103(a) as being unpatentable over Kawai (JP 01-266966) in view of Shintani et al. (US 6,255,618).

Claim 7, as amended, recites the feature of a secondary control section for decreasing the welding current from a point of the increased gradient so as to fall vertically to a first current not smaller than a first predetermined lower limit, the first predetermined lower limit having a current value greater than that of the base current, on detecting a moment at which a tip of a wire has a neck just before recovery from a short-circuit.

Applicants respectfully submit that Kawai and Shintani do not disclose or suggest at least the above-noted feature recited in amended claim 7.

Regarding Kawai, Applicants note that the current waveform shown in Figs. 2 and 5 is similar to the current waveform shown in Fig. 4 of the present application, which depicts the current waveform of a conventional arc welding device.

In this regard, Applicants note that while the current waveform shown in Figs. 2 and 5 of Kawai shows that current decreases, that Kawai does not disclose or suggest the above-noted feature recited in amended claim 7 of a secondary control section for decreasing the welding current from a point of the increased gradient so as to fall vertically to a first current not smaller than a first predetermined lower limit, the first predetermined lower limit having a current value greater than that of the base current, on detecting a moment at which a tip of a wire has a neck just before recovery from a short-circuit.

Regarding Shintani, Applicants note that while this reference discloses the use of a reference value storage portion, that Shintani does not disclose, suggest or otherwise render obvious the above-noted feature recited in amended claim 7 of a secondary control section for decreasing the welding current from a point of the increased gradient so as to fall vertically to a first current not smaller than a first predetermined lower limit, the first predetermined lower limit having a current value greater than that of the base current, on detecting a moment at which a tip of a wire has a neck just before recovery from a short-circuit.

In view of the foregoing, Applicants respectfully submit that the cited prior art does not disclose, suggest or otherwise render obvious the above-noted feature recited in amended claim 7. Accordingly, Applicants submit that amended claim 7 is patentable over the cited prior art, an indication of which is kindly requested.

Regarding claims 8-10, 12 and 13, Applicants note that these claims depend from claim 7 and are therefore considered patentable at least by virtue of their dependency.

In addition, regarding claim 9, Applicants note that this claim has been amended to recite that the secondary control section decreases the welding current to a second current not smaller

than a second predetermined lower limit, and the welding current is maintained at the second current for a predetermined period by carrying out constant current control.

With respect to Kawai, Applicants note that while Figs. 2 and 5 of Kawai show that current decreases, that Kawai does not disclose or suggest the feature of a secondary control section that decreases the welding current to a second current not smaller than a second predetermined lower limit, and the welding current is maintained at the second current for a predetermined period by carrying out constant current control.

Further, Applicants submit that Shintani does not cure the above-noted deficiency of Kawai. Accordingly, Applicants submit that claim 9 is patentable over the cited prior art, an indication of which is kindly requested.

C. Claim 11 has been rejected under 35 U.S.C. 103(a) as being unpatentable over Kawai (JP 01-266966) in view of Shintani et al. (US 6,255,618), and further in view of Oku (US 3,36,473).

Claim 11 depends from claim 7. Applicants submit that Oku fails to cure the deficiencies of Kawai and Shintani, as discussed above, with respect to claim 7. Accordingly, Applicants submit that claim 11 is patentable at least by virtue of its dependency.

### **III. Allowable Subject Matter**

Regarding claims 17-21, Applicants note that these claims have not been rejected on the basis of prior art. Accordingly, Applicants presume that these claims contain allowable subject matter, and would be allowable if rewritten in independent form.

#### **IV. Conclusion**

In view of the above, reconsideration and allowance of this application are now believed to be in order, and such actions are hereby solicited. If any points remain in issue, the Examiner is kindly requested to contact the undersigned at the telephone number listed below.

Respectfully submitted,

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